BMP #51 - Wet Vault/Tank

Targeted Pollutants

60% Sediment

30% Phosphorus

◒ Trace metals

○ Bacteria

○ Petroleum hydrocarbons

Physical Limits

Drainage area 5 ac

Max slope 15%

Min bedrock depth 12 ft

Min water table 12 ft

SCS soil type ABC

Freeze/Thaw fair

Drainage/Flood control yes

DESCRIPTION

Wet vaults and tanks are underground facilities used for the storage of surface water, and are typically constructed from reinforced concrete (vaults) or corrugated pipe (tanks). The water that is captured in these vaults and tanks may be used later for irrigation of parkstrips, common areas and general landscaping activities. Wet vaults and tanks are typically concrete or structural facilities designed to provide runoff treatment through the use of a permanent pool of water.

Planning Considerations

See BMP #45, Wet Pond - Conventional Pollutants. Additional planning considerations are provided below.

Limitations

Wet vaults/tanks cannot provide the equivalent level of treatment accomplished by wet ponds and constructed wetlands because neither biological uptake nor vegetative filtration are available as pollutant removal mechanisms, however re-use of stormwater runoff for landscaping purposes does provide a beneficial nutrient treatment mechanism. Gravity-settling of suspended solids is the primary removal mechanism but vaults/tanks are unlikely to be as effective as open ponds in removing particulates because little or no soil layer exists in which to permanently stabilize trapped sediments. Also, being underground, vaults and tanks are more difficult to inspect and maintain. Therefore, they should only be permitted for use on small sites, and then only after it has been demonstrated to the satisfaction of the local government that more desirable BMPs are not practicable.

Wet vaults/tanks should be a minimum of 20 feet from any structure, property line, and from any septic tank. Wet vaults/tanks should be a minimum of 100 feet from any domestic well or natural spring. All facilities should be a minimum of 50 feet from any steep slope. A geotechnical report must address the potential impact on a steep slope.

Design Parameters

The design volumes for a wet vault/tank should be the same as for BMP #45, Wet Pond-Conventional Pollutants.

Forebay

The vault should be divided into 2 cells using a baffle, with the first cell, the forebay, occupying about 25 percent of the area. The top of the baffle wall must be coincident with the depth of the permanent pool.

Construction Guidelines

Selected guidelines were excerpted from the Idaho Transportation Department Catalog of BMPs (July, 1994). ITD materials should be consulted for more detailed construction guidelines.

Materials

(a) Vaults

Minimum 3000 psi structural reinforced concrete. All construction joints must be provided with water stops. Pre-cast vaults should be designed by a structural engineer.

(b) Tank

Pipe material, joints, and protective treatment for tanks should be in accordance with Idaho State Department of Transportation (ISDOT) standards and specifications, and AASHTO designations as noted below:

Structural Stability

(a) Vaults

All vaults should meet structural requirements for overburden support and HS-20 traffic loading. Cast-in-place wall sections should be designed as retaining walls. All structural designs should be stamped by a structural engineer licensed in the state of Idaho. Structural designs for cast-in-place vaults may require a separate commercial building permit from the local government. Vaults should be placed on native material with suitable bedding. Vaults should not be allowed in fill slopes unless analyzed in a geotechnical report for stability and construction practices.

(b) Tanks

All tanks should meet structural requirements for overburden support and traffic loading, if appropriate. HS-20 live loads must be accommodated for tanks lying under roadways or parking areas. Metal tank end plates must be designed for structural stability at maximum hydrostatic loading conditions. Flat end plates generally require thicker gauge material than the pipe and/or require reinforcing ribs. Tanks should be placed on native material with a suitable bedding. Tanks should not be allowed in fill slopes.

(c) Buoyancy (Tanks)

In moderately pervious soils where seasonal groundwater may induce flotation, buoyancy tendencies must be balanced by ballasting with either backfill or concrete backfill, providing concrete anchors, increasing the total weight, or by providing subsurface drains to permanently lower the groundwater table. Calculations must be submitted which demonstrate stability.

Minimum Access Requirements

(a) Vaults

Provide one access cover per 50 feet of length or width and at least one access cover with ladder to the bottom of the vault per cell. The minimum internal height should be 7 feet and the minimum width should be 4 feet. The maximum depth to the vault invert should be 20 feet. (Note, concrete vaults may be a minimum of 3 feet in height and width if used as tanks with access manholes at each end).

(b) Tanks

The maximum depth to the bottom of the tank should be 20 feet. Spacing between access openings for tanks should not exceed 100 feet. All tank access openings must be readily accessible by maintenance vehicles.

Locking Lids

All vault access openings should have round, solid, locking lids using 1/2 inch diameter allen head screw locks.

Maintenance

Vaults should be inspected regularly and maintenance performed as indicated in the table below.

Access Roads

Access roads are required to at least one access cover for each cell. The access roads should meet the requirements for access roads described in the maintenance details for wet ponds.

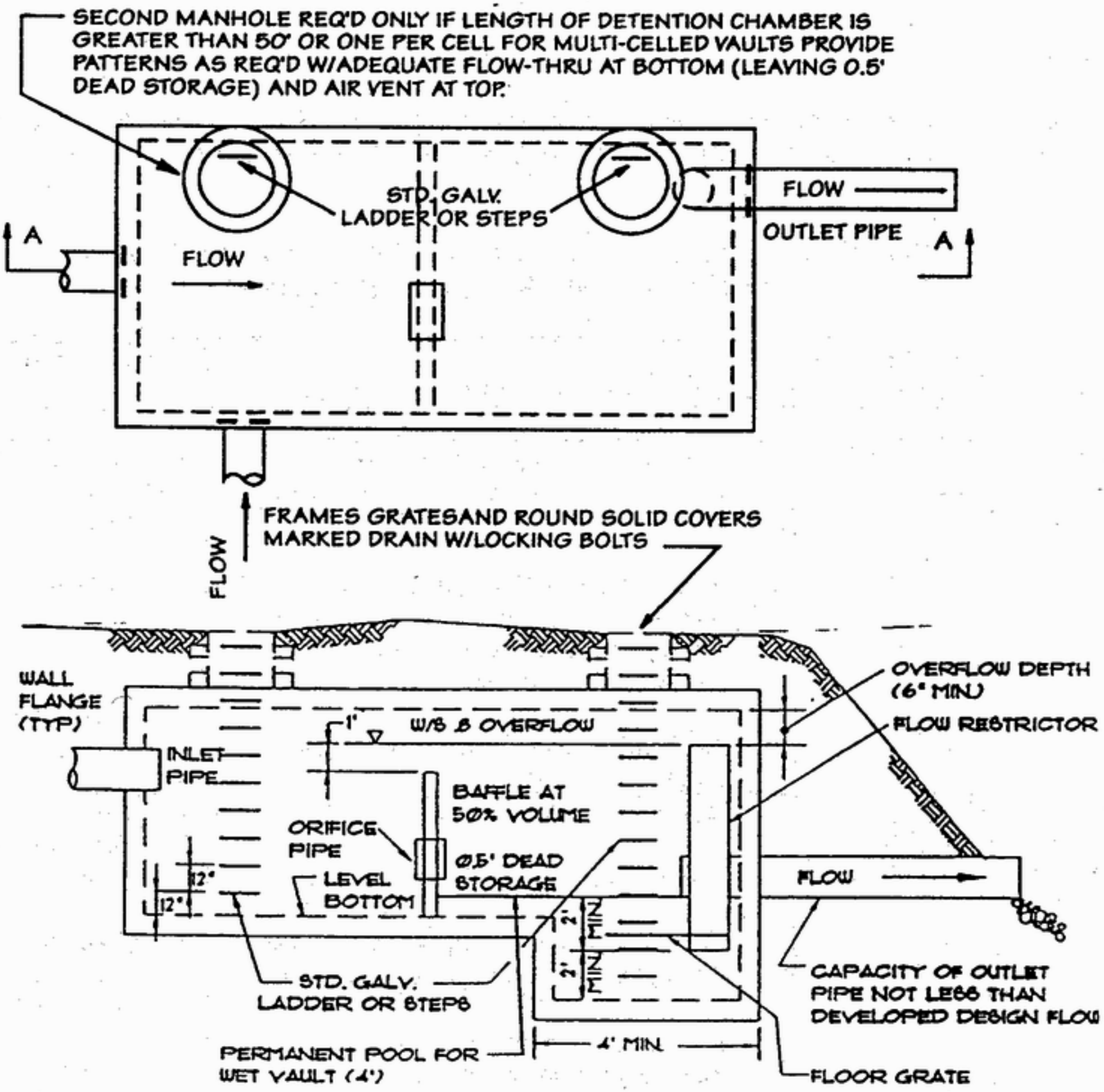
Specific Maintenance Requirements for Detention Vaults/Tanks

(Stormwater Management Manual, Puget Sound Basin)

Defect	**Maintenance Component**	**Conditions When Maintenance is Needed**	**Results Expected When Maintenance is Performed**
I. Storage Area - Plugged air vents	Debris and sediment	• One-half of the end area of a vent is blocked at any point with debris and sediment. • Accumulated sediment depth is 10% of the diameter of the storage area for 1/2 the length of the storage vault or any point exceeds 15% of the diameter. Any crack allowing material to be transported into the facility.	• All sediment and debris removed from storage area. • Vents free of debris and sediment. • All joints between tank/ pipe sections are sealed.

II. Manhole Cover not in place	Locking mechanism not working	• Cover difficult to remove • Ladder rungs unsafe • Cover is missing or only partially in place. Any open manhole requires maintenance. • Mechanism cannot be opened by one maintenance person with proper tools. Bolts into frame have < 1/2 inch of thread (may not apply to self-locking lids) • One maintenance person cannot remove lid after applying 800 pounds of lift. Intent is to keep cover from sealing off access to maintenance. • Local Government Safety Officer and/or maintenance person judge that ladder is unsafe due to missing rungs, misalignment, rust or cracks.	• Manhole is closed. Mechanism opens with proper tools. • Cover can be removed and reinstalled by one maintenance person. • Ladder meets design standards and allows maintenance persons safe access.

TYPICAL DETENTION VAULT

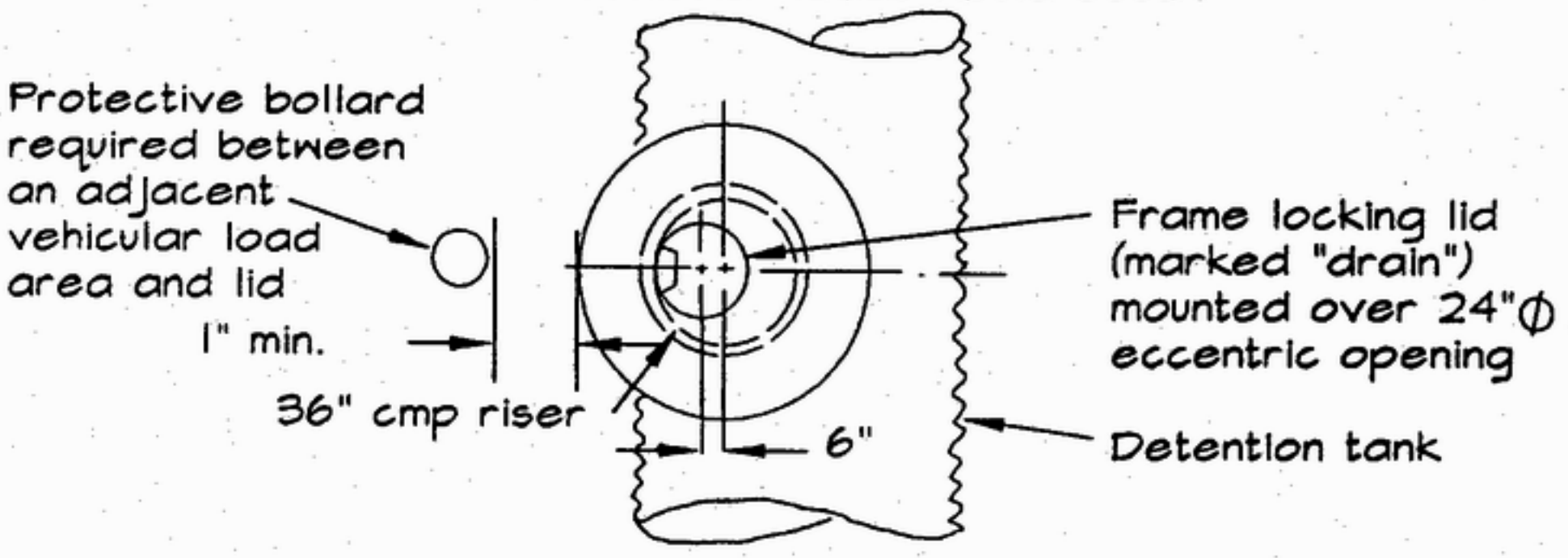


SECTION A-A

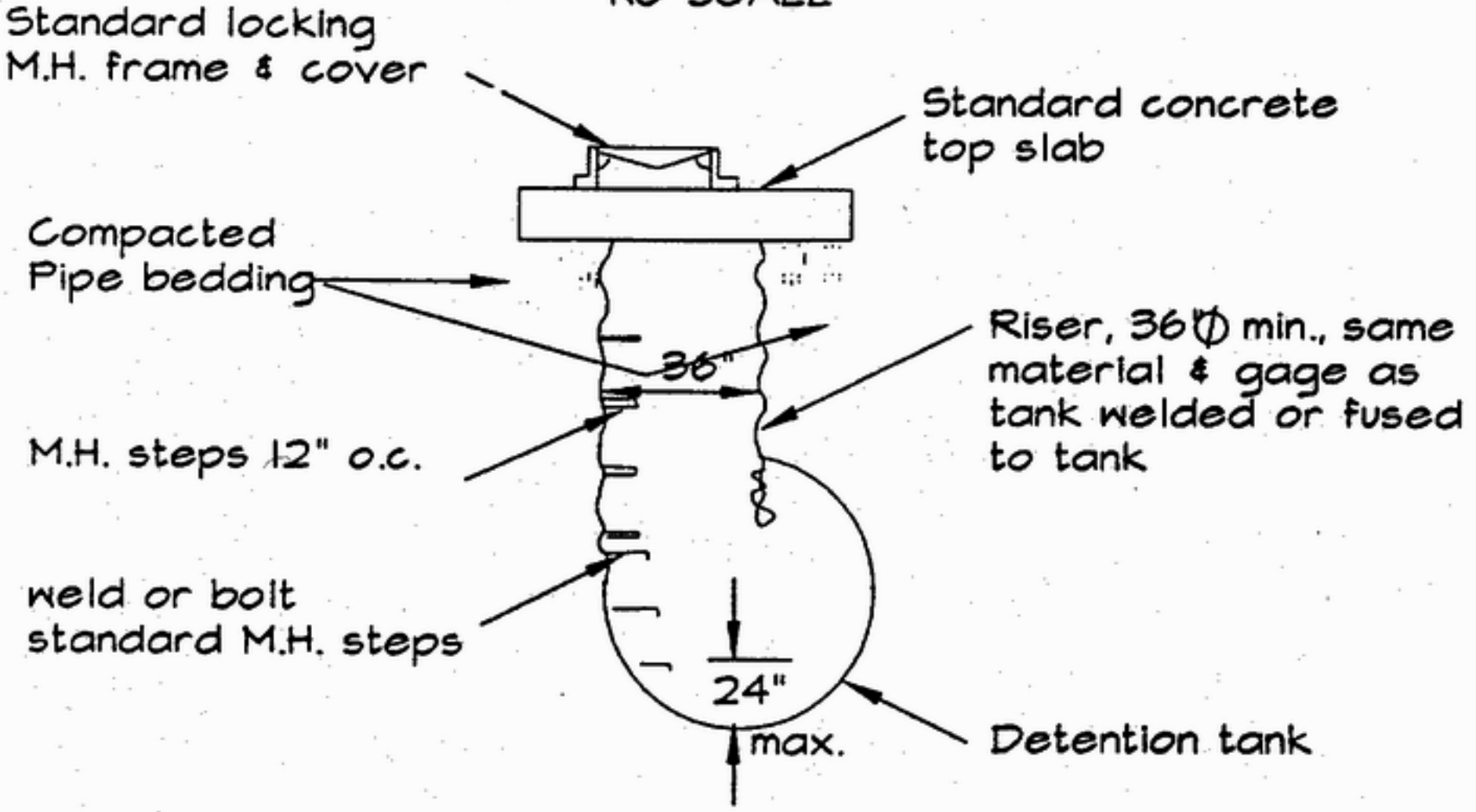
NO SCALE

DETENTION TANK ACCESS DETAIL

Restrictions for application: Use only for access to detention tanks. Not allowed for use in roadways, driveways, parking stalls or where vehicular loads would occur



PLAN VIEW
NO SCALE



SECTION
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NOTES:
1. Use adjusting blocks as req'd to bring frame to grade
2. All materials to be aluminum or galvanized & asphalt coated (treatment 1 or better)
3. Must be located for access by maintenance vehicles